CLAIMS

1. A method for determining a location at which ranging signals (RS1-RS4) from at least three satellites (SV1-SV4) have been received, wherein results of measurements performed on said ranging signals (RS1-RS4) include truncated timing measurement results for at least one of said satellites (SV1-SV4), and wherein said location is apriori known to be located within an initial location uncertainty area, said method comprising the steps of:

performing at least one pseudorange selection cycle (511, 512);

determining (505) said location utilizing pseudoranges (1004) selected after performing said at least one pseudorange selection cycle (511, 512),

wherein said at least one pseudorange selection cycle includes an initial selection cycle (511) comprising the substeps of:

determinining (501) a first pseudorange (r11) which with respect to said initial location uncertainty area is an admissible pseudorange associated with a first satellite (SV1);

determining (502) all pseudoranges (r21, r22, r31, r32) associated with at least two additional satellites (SV2, SV3) which combined with said first pseudorange (r11) form admissible relative pseudoranges;

forming (503) a set (1001) of pseudorange vectors representing all possible combinations of said determined pseudoranges (r11, r21, r22, r31, r32) associated with said first (SV1) and at least two additional satellites (SV2, SV3);

forming (504) a set (1002) of selected pseudorange vectors by selecting at least one vector from said set (1001) of pseudorange vectors,

wherein at least when said set (1001) of pseudorange vectors includes plural vectors, said selecting includes evaluating each vector in said set (1001) of pseudorange vectors according to a predetermined rule for initial vector selection.

2. A method according to claim 1, wherein said evaluating of each vector according to said predetermined rule for initial vector selection is performed only when said set (1001) of pseudorange vectors includes plural vectors.

3. A method according to claim 1, wherein said evaluating of each vector according to said predetermined rule for initial selection is performed also when said set (1001) of pseudorange vectors includes a single vector.

4. A method according to any one of claims 1-3, wherein evaluation according to said predetermined rule for initial vector selection includes comparing locations associated with said vectors in said set (1001) of pseudorange vectors and the initial location uncertainty area.

5. A method according to any one of claims 1-4, wherein when said at least two additional satellites includes more than two additional satellites, evaluation according to said predetermined rule for initial vector selection includes calculating a minimum loss function value for each vector in said set (1001) of pseudorange vectors.

6. A method according to claim 5, wherein vectors associated with minimum loss function values below a predefined threshold value are selected for inclusion in said set (1002) of selected pseudorange vectors.

7. A method according to claim 5, wherein the vector associated with the least minimum loss function value is selected for inclusion in said set (1002) of selected pseudorange vectors.

8. A method according to any one of claims 1-7, wherein said at least one pseudorange selection cycle (511, 512) includes at least one additional selection cycle (512) comprising the substeps of:

determining (506) all pseudoranges (r41, r42) associated with at least one additional satellite (SV4) which combined with said first pseudorange (r11) form admissible relative pseudoranges;

forming (507) a new set (1003) of pseudorange vectors representing all possible combinations of pseudorange vectors selected in the previous selection cycle (511, 512) and said determined pseudoranges (r41, r42) associated with said at least one additional satellite (SV4);

forming (508) a new set (1004) of selected pseudorange vectors by selecting at least one vector from said new set (1003) of pseudorange vectors, wherein at least when said new set (1003) of pseudorange vectors includes plural vectors, said selecting includes evaluating each vector in said new set (1003) of pseudorange vectors according to a predetermined rule for subsequent vector selection.

9. A method according to claim 8, wherein said evaluating of each vector according to said predetermined rule for subsequent vector selection is performed only when said new set (1003) of pseudorange vectors includes plural vectors.

10. A method according to claim 8, wherein said evaluating of each vector according to said predetermined rule for subsequent vector selection is performed also when said new set (1003) of pseudorange vectors includes a single vector.

11. A method according to any one of claims 8-10, wherein evaluation according to said predetermined rule for subsequent vector selection includes comparing locations associated with said vectors in said new set (1003) of pseudorange vectors and the initial location uncertainty area.

12. A method according to any one of claims 8-11, wherein evaluation according to said predetermined rule for initial vector selection includes calculating a minimum loss function value for each vector in said new set (1003) of pseudorange vectors.

13. A method according to claim 12, wherein vectors associated with minimum loss function values below a predefined threshold value are selected for inclusion in said new set of selected pseudorange vectors.

14. A method according to claim 12, wherein the vector associated with the least minimum loss function value is selected for inclusion in said new set of selected pseudorange vectors.

15. A method according to any one of claims 1-14, wherein the satellites are part of the Global Positioning System.

16. A method according to any one of claims 1-15, wherein after a pseudorange selection cycle resulting in the selection of a single pseudorange vector, said single pseudorange vector is used to determine an updated location uncertainty area within the initial location uncertainty area and said step of determining said location is performed using said updated location uncertainty area.

17. A method according to any one of claims 1-16, wherein admissible relative pseudoranges satisfy

$\delta\rho_i - \Delta_i \leq \rho_i^* - \rho_1^* \leq \delta\rho_i + \Delta_i$, wherein

$\rho_i^* - \rho_1^*$ is the relative pseudorange formed by a pseudorange ρ_i^* associated with satellite i and said first pseudorange ρ_1^* associated with said first satellite,

$\delta\rho_i$ is the mean value of the maximum and minimum differences between the range to satellite i and the range to the first

satellite found at any point within the initial location uncertainty area,

Δ_i is half the difference between the maximum and minimum differences between the range to satellite i and the range to the first satellite found at any point within the initial location uncertainty area

18. A method according to any one of claims 1-17, wherein said first admissible pseudorange associated with said first satellite satisfy

$\rho_1^* = round((\rho_1' - \nu_1)/R)R + \nu_1$, wherein

ρ_1^* is said first pseudorange associated with said first satellite,

ρ_1' is a predicted pseudorange to said first satellite,

R is a truncation interval applied for measurements on ranging signals from said first satellite expressed as a range and

ν_1 is a measured truncated pseudorange to said first satellite.

19. An apparatus (101) for determining a location at which ranging signals (RS1-RS4) from at least three satellites (SV1-SV4) have been received, wherein results from timing measurements performed on said ranging signals (RS1-RS4) include truncated timing measurement results for at least one of said satellites (SV1-SV4), and wherein said location is apriori known to be located within an initial location uncertainty area, said apparatus including digital data processing circuitry (CP1) adapted to:

perform at least one pseudorange selection cycle (511, 512);

determine said location utilizing pseudoranges (1004) selected after said at least one pseudorange selection cycle,

wherein said at least one pseudorange selection cycle includes an initial selection cycle (511),

and wherein said digital processing circuitry (CP1) is adapted to perform said initial selection cycle (511) by:

determinining a first pseudorange (r11) which with respect to said initial location uncertainty area is an admissible pseudorange associated with a first satellite (SV1);

determining all pseudoranges (r21, r22, r31, r32) associated with at least two additional satellites (SV2, SV3) which combined with said first pseudorange (r11) form admissible relative pseudoranges;

forming a set (1001) of pseudorange vectors representing all possible combinations of said determined pseudoranges (r11, r21, r22, r31, r32) associated with said first (SV1) and at least two additional satellites (SV2, SV3);

forming a set (1002) of selected pseudorange vectors by selecting at least one vector from said set (1001) of pseudorange vectors,

wherein at least when said set (1001) of pseudorange vectors includes plural vectors, said selecting includes evaluating each vector in said set (1001) of pseudorange vectors according to a predetermined rule for initial vector selection.

20. An apparatus according to claim 19, wherein said data processing circuitry is adapted to evaluate each vector according to said predetermined rule for initial vector selection only when said set (1001) of pseudorange vectors includes plural vectors.

21. An apparatus according to claim 19, wherein said data processing circuitry is adapted to evaluate each vector according to said predetermined rule for initial vector selection also when said set of pseudorange vectors includes a single vector.

22. An apparatus according to any one of claims 19-21, wherein evaluation according to said predetermined rule for initial vector selection includes comparing locations associated with said vectors in said set of pseudorange vectors and the initial location uncertainty area.

23. An apparatus according to any one of claims 19-22, wherein when said at least two additional satellites includes more than two additional satellites, evaluation according to said predetermined rule for initial vector selection includes calculating a minimum loss function value for each vector in said set of pseudorange vectors.

24. An apparatus according to claim 23, wherein vectors associated with minimum loss function values below a predefined threshold value are selected for inclusion in said set of selected pseudorange vectors.

25. An apparatus according to claim 23, wherein the vector associated with the least minimum loss function value is selected for inclusion in said set of selected pseudorange vectors.

26. An apparatus according to any one of claims 19-25, wherein said at least one pseudorange selection cycle (511, 512) includes at least one additional selection cycle (512), and wherein said digital data processing circuitry is adapted to perform said at least one additional selection cycle by:

determining all pseudoranges (r41, r42) associated with at least one additional satellite (SV4) which combined with said first pseudorange (r11) form admissible relative pseudoranges;

forming a new set (1003) of pseudorange vectors representing all possible combinations of pseudorange vectors selected in the previous selection cycle (511, 512) and said determined pseudoranges (r41, r42) associated with said at least one additional satellite (SV4);

forming a new set (1004) of selected pseudorange vectors by selecting at least one vector from said new set (1003) of pseudorange vectors,

wherein at least when said new set (1003) of pseudorange vectors includes plural vectors, said selecting includes evaluating each vector in said new set (1003) of pseudorange vectors according to a predetermined rule for subsequent vector selection.

27. An apparatus according to claim 26, wherein said data processing circuitry is adapted to evaluate each vector according to said predetermined rule for subsequent vector selection only when said new set (1003) of pseudorange vectors includes plural vectors.

28. An apparatus according to claim 26, wherein said data processing circuitry is adapted to evaluate each vector according to said predetermined rule for subsequent vector selection also when said new set of pseudorange vectors includes a single vector.

29. An apparatus according to any one of claims 26-28, wherein evaluation according to said predetermined rule for subsequent vector selection includes comparing locations associated with said vectors in said new set of pseudorange vectors and the initial location uncertainty area.

30. An apparatus according to any one of claims 26-29, wherein evaluation according to said predetermined rule for initial vector selection includes calculating a minimum loss function value for each vector in said new set (1003) of pseudorange vectors.

31. An apparatus according to claim 30, wherein vectors associated with minimum loss function values below a predefined threshold value are selected for inclusion in said new set of selected pseudorange vectors.

32. An apparatus according to claim 30, wherein the vector associated with the least minimum loss function value is selected for inclusion in said new set of selected pseudorange vectors.

33. A computer program embodied on a computer-readable medium and executable by digital data processing circuitry (CP1) to perform a method according to any one of claims 1-18.